Amendment Continued
Serial No. 10/724,551

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claims 1-10 (canceled)

11.(currently amended) An echelle structure for use in an optical device comprising:

a grating surface disposed between input and output apertures, the grating surface including a plurality of contiguous reflective ~~facet portions~~ facets selectively disposed in a non-constant period arrangement to define a predetermined narrow-band temporal optical transfer function H(v) between the input and output apertures, where v represents frequency in Hz and H(v) represents a complex function having an amplitude A(v) and a phase θ(v);

respective facets of at least a pair of contiguous reflective facets, ~~facet, portions~~ being unequal in spacing and width dimensions.

12.(currently amended) An optical device for realizing ~~an arbitrary~~ a narrow-band temporal optical transfer function; the device comprising:

entrance and exit apertures each operable to spatially single-mode filter an optical field incident thereon over a prescribed wavelength range of operation;

an echelle structure disposed between the entrance and exit apertures, the echelle structure having a grating surface including a plurality of contiguous reflective facets ~~facet portions~~ selectively disposed in a non-constant period arrangement, respective facets of at least a pair of contiguous reflective facets ~~facet portions~~ being unequal in spacing, and with dimensions; and

~~a means of collimating~~ optical outputs of the single-mode entrance and exit apertures being collimated such that components of an input beam, ~~resulting from the collimation of the single-mode entrance aperture,~~ is incident upon a facet of the grating surface of the echelle structure at a common angle of incidence, and components of an output beam reflected by the grating surface toward the single-mode exit aperture being directed at a common angle relative to a facet of the grating surface.

13.(currently amended) A method of fabricating an echelle structure having a grating surface including a plurality of reflective facets ~~facet portions~~ selectively disposed in a non-constant period arrangement, respective facets of at least a pair of reflective facets ~~facet portions~~ being unequal in spacing and width dimensions, for use in an optical system having input and output apertures; the method comprising the steps of:

a) selecting sampling interval of T seconds, where T is not longer than one-half the reciprocal of a frequency range, in Hz, over which a predetermined narrow-band temporal optical transfer function H(ν) is uniquely specified, where ν represents frequency in Hz and H(ν) represents a complex function having an amplitude A(ν) and a phase θ(ν);

b) selecting a number M of echelle facets to be illuminated by an input optical beam, based upon the chosen sampling interval T and a minimum resolvable spectral feature W, in Hz, present in either the amplitude A(ν) or the phase θ(ν), where $M \geq \frac{1}{WT}$ rounded up to the nearest integer;

c) specifying a frequency νc, in Hz, about which a characteristic curve for H(ν) is approximately centered;

d) determining a vector $\vec{h}$ of complex impulse response coefficients, each defined by, $$h_m = \int_{\nu c-\frac{1}{2T}}^{\nu c+\frac{1}{2T}} H(\nu)e^{j2\pi\nu mT}d\nu$$, having an amplitude a_m and a phase φ_m, where j = $\sqrt{-1}$ is the imaginary unit, where m represents a counting index for the complex impulse response coefficients and $0 \leq m \leq M-1$;

e) normalizing the complex impulse response coefficient amplitudes, a_m by multiplying each by a common factor K, such that $\sum_{m=0}^{M-1} K \cdot a_m = 1$;

f) starting at one edge of the input beam, at $x = 0$, selecting a transverse width w_0 of a first illuminated facet, corresponding to $m = 0$, such that the fraction of the input beam energy reflected by one said facet corresponds precisely to Ka_0, whereupon said facet is located in a transverse position between $x = 0$ and $x = w_0$;

g) selecting a transverse width w_1 of the next illuminated facet in the grating surface, corresponding to $m = 1$, such that the fraction of the input beam energy reflected by said next illuminated facet corresponds precisely to Ka_1, whereupon said next illuminated facet is located in a transverse position between $x = w_0$ and $x = w_0 + w_1$;

h) iterating step g) M-2 times, to find respective transverse widths and transverse positions for the remaining M-2 illuminated facets;

i) setting the precise longitudinal position, along the direction of propagation of the input beam, of the center of the m'th illuminated facet, such that a relative delay, compared to a predetermined time reference, experienced by an optical ray incident upon said illuminated facet and collected at the exit aperture is defined by $\Delta t_m = mT + \varphi_m /(2\pi\nu c)$.

14.(currently amended) The method of fabricating the echelle structure recited in claim 13, <u>wherein</u> ~~the~~ input and output beams are collimated.

15.(previously presented) The echelle structure recited in claim 11 wherein said structure is replicated from a master.

16.(previously presented) The echelle structure recited in claim 11 wherein each said facet being illuminated is coated for increased reflectivity.

17.(currently amended) The method recited in claim 14 wherein a single-mode optical fiber provides at least one of said entrance and exit apertures ~~comprises a single-mode optical fiber~~.

18.(canceled)